SEQUENCE LISTING

<110> MIYAKE, Koichiro; HASHIMOTO, Shinichi; MOTOYAMA Hiroaki; OZAKI, Akio; SETO, Haruo; KUZAYAMA, Tomohisa; TAKAHASHI, Shunji

<120> A process for producing isoprenoid compounds by microorganisms and a method for screening compounds with antibiotic or weeding activity

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<140> PCT/JP99/01987
<141> 1999-04-14

<150> JP98/103101
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<150> JP98/221910
<151> 1998-08-05

<150> JP99/035739
<151> 1999-02-15

<160> 34

<170> PatentIn Ver. 2.0

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180 185 190

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180 185 190

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195 200 205

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210 215 220

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245 250 255

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260 265 270

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290 295 300

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Gly Gln Gln Ala Ala Cys Asp Met Ala Ala Leu Glu Asp Val Asp Gln
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180 185 190

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Ala Ser Ala Ser Gln Met Glu Val Leu Ile His Pro Gln Ser Val Ile
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His Phe Ala Ser Gly Leu Gly Thr Val Glu Leu Thr Val Ala Leu His
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Gln Ala Tyr Pro His Lys Ile Leu Thr Gly Arg Arg Asp Lys Ile Gly
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Arg Thr Val Cys Val Ile Gly Asp Gly Ala Ile Thr Ala Gly Met Ala

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165 170 175

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aac aac cat ctg gca cag ctg ctt tcc ggt aag ctt tac tct tca ctg 624

Asn Asn His Leu Ala Gln Leu Leu Ser Gly Lys Leu Tyr Ser Ser Leu
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370 375 380

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Tyr His Tyr Asn Asp Gly Pro Ser Ala Val Arg Tyr Pro Arg Gly Asn
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Leu Ile His Asp Asp Leu Pro Ala Met Asp Asp Asp Asp Leu Arg Arg
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145 150 155 160

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Asp Leu Asp Ala Glu Gly Lys His Val Pro Leu Asp Ala Leu Glu Arg
165 170 175

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Gly Ala Leu Ser Ala Gly Asp Lys Gly Arg Arg Ala Leu Pro Val Leu
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Glu Gln Ala Arg Lys Lys Ala Arg Asp Leu Ile Asp Asp Ala Arg Gln
260 265 270

tcg ctg aaa caa ctg gct gaa cag tca ctc gat acc tcg gca ctg gaa 864

Ser Leu Lys Gln Leu Ala Glu Gln Ser Leu Asp Thr Ser Ala Leu Glu
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gaa gag gcg ctg aac gag ttc gaa cgc ggc gtg cag ctg gca cgt cag 144

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35 40 45

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Gly Gln Ala Lys Leu Gln Gln Ala Glu Gln Arg Val Gln Ile Leu Leu
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cgt ccc ata att aaa cgt gca ctg gaa ggc ggc ata aat ttc ttt gat   240

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acc gcc aac agt tat tct gac ggc agc agc gaa gag atc gtc ggt cgc   288

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115 120 125

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130 135 140

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Glu Thr Leu Glu Ala Leu Asn Asp Val Val Lys Ala Gly Lys Ala Arg
165 170 175

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Tyr Ile Gly Ala Ser Ser Met His Ala Ser Gln Phe Ala Gln Ala Leu
180 185 190

gaa ctc caa aaa cag cac ggc tgg gcg cag ttt gtc agt atg cag gat 624

Glu Leu Gln Lys Gln His Gly Trp Ala Gln Phe Val Ser Met Gln Asp

195 200 205

cac tac aat ctg att tat cgt gaa gaa gag cgc gag atg cta cca ctg 672

His Tyr Asn Leu Ile Tyr Arg Glu Glu Glu Arg Glu Met Leu Pro Leu
210 215 220

tgt tat cag gag ggc gtg gcg gta att cca tgg agc ccg ctg gca agg 720

Cys Tyr Gln Glu Gly Val Ala Val Ile Pro Trp Ser Pro Leu Ala Arg
225 230 235 240

ggc cgt ctg acg cgt ccg tgg gga gaa act acc gca cga ctg gtg tct 768

Gly Arg Leu Thr Arg Pro Trp Gly Glu Thr Thr Ala Arg Leu Val Ser
245 250 255

gat gag gtg ggg aaa aat ctc tat aaa gaa agc gat gaa aat gac gcg 816

Asp Glu Val Gly Lys Asn Leu Tyr Lys Glu Ser Asp Glu Asn Asp Ala
260 265 270

cag atc gca gag cgg tta aca ggc gtc agt gaa gaa ctg ggg gcg aca 864

Gln Ile Ala Glu Arg Leu Thr Gly Val Ser Glu Glu Leu Gly Ala Thr
275 280 285

cga gca caa gtt gcg ctg gcc tgg ttg ttg agt aaa ccg ggc att gcc 912

Arg Ala Gln Val Ala Leu Ala Trp Leu Leu Ser Lys Pro Gly Ile Ala
290 295 300

gca ccg att atc gga act tcg cgc gaa gaa cag ctt gat gag cta ttg 960

Ala Pro Ile Ile Gly Thr Ser Arg Glu Glu Gln Leu Asp Glu Leu Leu
305 310 315 320

aac gcg gtg gat atc act ttg aag ccg gaa cag att gcc gaa ctg gaa 1008

Asn Ala Val Asp Ile Thr Leu Lys Pro Glu Gln Ile Ala Glu Leu Glu
325 330 335

acg ccg tat aaa ccg cat cct gtc gta gga ttt aaa 1044

Thr Pro Tyr Lys Pro His Pro Val Val Gly Phe Lys
340 345

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<211> 1194
<212> DNA
<213> Escherichia coli

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<222> (1)..(1194)

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Met Lys Gln Leu Thr Ile Leu Gly Ser Thr Gly Ser Ile Gly Cys Ser
1 5 10 15

acg ctg gac gtg gtg cgc cat aat ccc gaa cac ttc cgc gta gtt gcg 96

Thr Leu Asp Val Val Arg His Asn Pro Glu His Phe Arg Val Val Ala

20 25 30

ctg gtg gca ggc aaa aat gtc act cgc atg gta gaa cag tgc ctg gaa 144

Leu Val Ala Gly Lys Asn Val Thr Arg Met Val Glu Gln Cys Leu Glu
35 40 45

ttc tct ccc cgc tat gcc gta atg gac gat gaa gcg agt gcg aaa ctt 192

Phe Ser Pro Arg Tyr Ala Val Met Asp Asp Glu Ala Ser Ala Lys Leu
50 55 60

ctt aaa acg atg cta cag caa cag ggt agc cgc acc gaa gtc tta agt 240

Leu Lys Thr Met Leu Gln Gln Gln Gly Ser Arg Thr Glu Val Leu Ser
65 70 75 80

ggg caa caa gcc gct tgc gat atg gca gcg ctt gag gat gtt gat cag 288

Gly Gln Gln Ala Ala Cys Asp Met Ala Ala Leu Glu Asp Val Asp Gln
85 90 95

gtg atg gca gcc att gtt ggc gct gct ggg ctg tta cct acg ctt gct 336

Val Met Ala Ala Ile Val Gly Ala Ala Gly Leu Leu Pro Thr Leu Ala
100 105 110

gcg atc cgc gcg ggt aaa acc att ttg ctg gcc aat aaa gaa tca ctg 384

Ala Ile Arg Ala Gly Lys Thr Ile Leu Leu Ala Asn Lys Glu Ser Leu
115 120 125

gtt acc tgc gga cgt ctg ttt atg gac gcc gta aag cag agc aaa gcg 432

Val Thr Cys Gly Arg Leu Phe Met Asp Ala Val Lys Gln Ser Lys Ala
130 135 140

caa ttg tta ccg gtc gat agc gaa cat aac gcc att ttt cag agt tta 480

Gln Leu Leu Pro Val Asp Ser Glu His Asn Ala Ile Phe Gln Ser Leu
145 150 155 160

ccg caa cct atc cag cat aat ctg gga tac gct gac ctt gag caa aat 528

Pro Gln Pro Ile Gln His Asn Leu Gly Tyr Ala Asp Leu Glu Gln Asn
165 170 175

ggc gtg gtg tcc att tta ctt acc ggg tct ggt ggc cct ttc cgt gag 576

Gly Val Val Ser Ile Leu Leu Thr Gly Ser Gly Gly Pro Phe Arg Glu
180 185 190

acg cca ttg cgc gat ttg gca aca atg acg ccg gat caa gcc tgc cgt 624

Thr Pro Leu Arg Asp Leu Ala Thr Met Thr Pro Asp Gln Ala Cys Arg
195 200 205

cat ccg aac tgg tcg atg ggg cgt aaa att tct gtc gat tcg gct acc 672

His Pro Asn Trp Ser Met Gly Arg Lys Ile Ser Val Asp Ser Ala Thr
210 215 220

atg atg aac aaa ggt ctg gaa tac att gaa gcg cgt tgg ctg ttt aac 720

Met Met Asn Lys Gly Leu Glu Tyr Ile Glu Ala Arg Trp Leu Phe Asn
225 230 235 240

gcc agc gcc agc cag atg gaa gtg ctg att cac ccg cag tca gtg att 768

Ala Ser Ala Ser Gln Met Glu Val Leu Ile His Pro Gln Ser Val Ile
245 250 255

cac tca atg gtg cgc tat cag gac ggc agt gtt ctg gcg cag ctg ggg 816

His Ser Met Val Arg Tyr Gln Asp Gly Ser Val Leu Ala Gln Leu Gly
260 265 270

gaa ccg gat atg gta cgc caa ttg ccc aca cca tgg gca tgg ccg aat 864

Glu Pro Asp Met Val Arg Gln Leu Pro Thr Pro Trp Ala Trp Pro Asn
275 280 285

cgc gtg aac tct ggc gtg aag ccg ctc gat ttt tgc aaa cta agt gcg 912

Arg Val Asn Ser Gly Val Lys Pro Leu Asp Phe Cys Lys Leu Ser Ala
290 295 300

ttg aca ttt gcc gca ccg gat tat gat cgt tat cca tgc ctg aaa ctg 960

Leu Thr Phe Ala Ala Pro Asp Tyr Asp Arg Tyr Pro Cys Leu Lys Leu
305 310 315 320

gcg atg gag gcg ttc gaa caa ggc cag gca gcg acg aca gca ttg aat 1008

Ala Met Glu Ala Phe Glu Gln Gly Gln Ala Ala Thr Thr Ala Leu Asn
325 330 335

gcc gca aac gaa atc acc gtt gct gct ttt ctt gcg caa caa atc cgc 1056

Ala Ala Asn Glu Ile Thr Val Ala Ala Phe Leu Ala Gln Gln Ile Arg

340 345 350

ttt acg gat atc gct gcg ttg aat tta tcc gta ctg gaa aaa atg gat 1104

Phe Thr Asp Ile Ala Ala Leu Asn Leu Ser Val Leu Glu Lys Met Asp
355 360 365

atg cgc gaa cca caa tgt gtg gac gat gtg tta tct gtt gat gcg aac 1152

Met Arg Glu Pro Gln Cys Val Asp Asp Val Leu Ser Val Asp Ala Asn
370 375 380

gcg cgt gaa gtc gcc aga aaa gag gtg atg cgt ctc gca agc 1194

Ala Arg Glu Val Ala Arg Lys Glu Val Met Arg Leu Ala Ser
385 390 395

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<211> 4390
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<213> Escherichia coli

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<221> CDS

<222> (1374).. (3233)

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<222> (3344).. (4390)

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ccacacctgc ggctgcatcc aggcgcggaa gtataccact aacatcgctt tgctgtgcac 120

atcaccttac cattgcgcgt tatttgctat ttgccctgag tccgttacca tgacggggcg 180

aaaaatattg agagtcagac attcatt atg ccg aag aaa aat gag gcg ccc gcc 234

Met Pro Lys Lys Asn Glu Ala Pro Ala

1 5

agc ttt gaa aag gcg ctg agc gag ctg gaa cag att gta acc cgt ctg 282

Ser Phe Glu Lys Ala Leu Ser Glu Leu Glu Gln Ile Val Thr Arg Leu

10 15 20 25

gaa agt ggc gac ctg ccg ctg gaa gag gcg ctg aac gag ttc gaa cgc 330

Glu Ser Gly Asp Leu Pro Leu Glu Glu Ala Leu Asn Glu Phe Glu Arg

30 35 40

ggc gtg cag ctg gca cgt cag ggg cag gcc aaa tta caa caa gcc gaa 378

Gly Val Gln Leu Ala Arg Gln Gly Gln Ala Lys Leu Gln Gln Ala Glu
45 50 55

cag cgc gta caa att ctg ctg tct gac aat gaa gac gcc tct cta acc 426

Gln Arg Val Gln Ile Leu Leu Ser Asp Asn Glu Asp Ala Ser Leu Thr
60 65 70

cct ttt aca ccg gac aat gag ta atg gac ttt ccg cag caa ctc gaa 473

Pro Phe Thr Pro Asp Asn Glu Met Asp Phe Pro Gln Gln Leu Glu
75 80 1 5

gcc tgc gtt aag cag gcc aac cag gcg ctg agc cgt ttt atc gcc cca 521

Ala Cys Val Lys Gln Ala Asn Gln Ala Leu Ser Arg Phe Ile Ala Pro
10 15 20

ctg ccc ttt cag aac act ccc gtg gtc gaa acc atg cag tat ggc gca 569

Leu Pro Phe Gln Asn Thr Pro Val Val Glu Thr Met Gln Tyr Gly Ala
25 30 35 40

tta tta ggt ggt aag cgc ctg cga cct ttc ctg gtt tat gcc acc ggt 617

Leu Leu Gly Gly Lys Arg Leu Arg Pro Phe Leu Val Tyr Ala Thr Gly
45 50 55

cat atg ttc ggc gtt agc aca aac acg ctg gac gca ccc gct gcc gcc 665

His Met Phe Gly Val Ser Thr Asn Thr Leu Asp Ala Pro Ala Ala Ala
60 65 70

gtt gag tgt atc cac gct tac tca tta att cat gat gat tta ccg gca 713

Val Glu Cys Ile His Ala Tyr Ser Leu Ile His Asp Asp Leu Pro Ala
75 80 85

atg gat gat gac gat ctg cgt cgc ggt ttg cca acc tgc cat gtg aag 761

Met Asp Asp Asp Asp Leu Arg Arg Gly Leu Pro Thr Cys His Val Lys
90 95 100

ttt ggc gaa gca aac gcg att ctc gct ggc gac gct tta caa acg ctg 809

Phe Gly Glu Ala Asn Ala Ile Leu Ala Gly Asp Ala Leu Gln Thr Leu
105 110 115 120

gcg ttc tcg att tta agc gat gcc gat atg ccg gaa gtg tcg gac cgc 857

Ala Phe Ser Ile Leu Ser Asp Ala Asp Met Pro Glu Val Ser Asp Arg
125 130 135

gac aga att tcg atg att tct gaa ctg gcg agc gcc agt ggt att gcc 905

Asp Arg Ile Ser Met Ile Ser Glu Leu Ala Ser Ala Ser Gly Ile Ala
140 145 150

gga atg tgc ggt ggt cag gca tta gat tta gac gcg gaa ggc aaa cac 953

Gly Met Cys Gly Gly Gln Ala Leu Asp Leu Asp Ala Glu Gly Lys His
155 160 165

gta cct ctg gac gcg ctt gag cgt att cat cgt cat aaa acc ggc gca 1001

Val Pro Leu Asp Ala Leu Glu Arg Ile His Arg His Lys Thr Gly Ala

170 175 180

ttg att cgc gcc gcc gtt cgc ctt ggt gca tta agc gcc gga gat aaa 1049

Leu Ile Arg Ala Ala Val Arg Leu Gly Ala Leu Ser Ala Gly Asp Lys
185 190 195 200

gga cgt cgt gct ctg ccg gta ctc gac aag tat gca gag agc atc ggc 1097

Gly Arg Arg Ala Leu Pro Val Leu Asp Lys Tyr Ala Glu Ser Ile Gly
205 210 215

ctt gcc ttc cag gtt cag gat gac atc ctg gat gtg gtg gga gat act 1145

Leu Ala Phe Gln Val Gln Asp Asp Ile Leu Asp Val Val Gly Asp Thr
220 225 230

gca acg ttg gga aaa cgc cag ggt gcc gac cag caa ctt ggt aaa agt 1193

Ala Thr Leu Gly Lys Arg Gln Gly Ala Asp Gln Gln Leu Gly Lys Ser
235 240 245

acc tac cct gca ctt ctg ggt ctt gag caa gcc cgg aag aaa gcc cgg 1241

Thr Tyr Pro Ala Leu Leu Gly Leu Glu Gln Ala Arg Lys Lys Ala Arg
250 255 260

gat ctg atc gac gat gcc cgt cag tcg ctg aaa caa ctg gct gaa cag 1289

Asp Leu Ile Asp Asp Ala Arg Gln Ser Leu Lys Gln Leu Ala Glu Gln
265 270 275 280

tca ctc gat acc tcg gca ctg gaa gcg cta gcg gac tac atc atc cag 1337

Ser Leu Asp Thr Ser Ala Leu Glu Ala Leu Ala Asp Tyr Ile Ile Gln
285 290 295

cgt aat aaa taaacaataa gtattaatag gcccctg atg agt ttt gat att gcc 1391
Arg Asn Lys Met Ser Phe Asp Ile Ala
1 5

aaa tac ccg acc ctg gca ctg gtc gac tcc acc cag gag tta cga ctg 1439
Lys Tyr Pro Thr Leu Ala Leu Val Asp Ser Thr Gln Glu Leu Arg Leu
10 15 20

ttg ccg aaa gag agt tta ccg aaa ctc tgc gac gaa ctg cgc cgc tat 1487
Leu Pro Lys Glu Ser Leu Pro Lys Leu Cys Asp Glu Leu Arg Arg Tyr
25 30 35

tta ctc gac agc gtg agc cgt tcc agc ggg cac ttc gcc tcc ggg ctg 1535
Leu Leu Asp Ser Val Ser Arg Ser Ser Gly His Phe Ala Ser Gly Leu
40 45 50

ggc acg gtc gaa ctg acc gtg gcg ctg cac tat gtc tac aac acc ccg 1583
Gly Thr Val Glu Leu Thr Val Ala Leu His Tyr Val Tyr Asn Thr Pro
55 60 65 70

ttt gac caa ttg att tgg gat gtg ggg cat cag gct tat ccg cat aaa 1631
Phe Asp Gln Leu Ile Trp Asp Val Gly His Gln Ala Tyr Pro His Lys
75 80 85

att ttg acc gga cgc cgc gac aaa atc ggc acc atc cgt cag aaa ggc 1679
Ile Leu Thr Gly Arg Arg Asp Lys Ile Gly Thr Ile Arg Gln Lys Gly
90 95 100

ggt ctg cac ccg ttc ccg tgg cgc ggc gaa agc gaa tat gac gta tta 1727
Gly Leu His Pro Phe Pro Trp Arg Gly Glu Ser Glu Tyr Asp Val Leu
105 110 115

agc gtc ggg cat tca tca acc tcc atc agt gcc gga att ggt att gcg 1775
Ser Val Gly His Ser Ser Thr Ser Ile Ser Ala Gly Ile Gly Ile Ala
120 125 130

gtt gct gcc gaa aaa gaa ggc aaa aat cgc cgc acc gtc tgt gtc att 1823
Val Ala Ala Glu Lys Glu Gly Lys Asn Arg Arg Thr Val Cys Val Ile
135 140 145 150

ggc gat ggc gcg att acc gca ggc atg gcg ttt gaa gcg atg aat cac 1871
Gly Asp Gly Ala Ile Thr Ala Gly Met Ala Phe Glu Ala Met Asn His
155 160 165

gcg ggc gat atc cgt cct gat atg ctg gtg att ctc aac gac aat gaa 1919
Ala Gly Asp Ile Arg Pro Asp Met Leu Val Ile Leu Asn Asp Asn Glu
170 175 180

atg tcg att tcc gaa aat gtc ggc gcg ctc aac aac cat ctg gca cag 1967

Met Ser Ile Ser Glu Asn Val Gly Ala Leu Asn Asn His Leu Ala Gln
185 190 195

ctg ctt tcc ggt aag ctt tac tct tca ctg cgc gaa ggc ggg aaa aaa 2015

Leu Leu Ser Gly Lys Leu Tyr Ser Ser Leu Arg Glu Gly Gly Lys Lys
200 205 210

gtt ttc tct ggc gtg ccg cca att aaa gag ctg ctc aaa cgc acc gaa 2063

Val Phe Ser Gly Val Pro Pro Ile Lys Glu Leu Leu Lys Arg Thr Glu
215 220 225 230

gaa cat att aaa ggc atg gta gtg cct ggc acg ttg ttt gaa gag ctg 2111

Glu His Ile Lys Gly Met Val Val Pro Gly Thr Leu Phe Glu Glu Leu
235 240 245

ggc ttt aac tac atc ggc ccg gtg gac ggt cac gat gtg ctg ggg ctt 2159

Gly Phe Asn Tyr Ile Gly Pro Val Asp Gly His Asp Val Leu Gly Leu
250 255 260

atc acc acg cta aag aac atg cgc gac ctg aaa ggc ccg cag ttc ctg 2207

Ile Thr Thr Leu Lys Asn Met Arg Asp Leu Lys Gly Pro Gln Phe Leu
265 270 275

cat atc atg acc aaa aaa ggt cgt ggt tat gaa ccg gca gaa aaa gac 2255

His Ile Met Thr Lys Lys Gly Arg Gly Tyr Glu Pro Ala Glu Lys Asp
280 285 290

ccg atc act ttc cac gcc gtg cct aaa ttt gat ccc tcc agc ggt tgt 2303

Pro Ile Thr Phe His Ala Val Pro Lys Phe Asp Pro Ser Ser Gly Cys
295 300 305 310

ttg ccg aaa agt agc ggc ggt ttg ccg agc tat tca aaa atc ttt ggc 2351

Leu Pro Lys Ser Ser Gly Gly Leu Pro Ser Tyr Ser Lys Ile Phe Gly
315 320 325

gac tgg ttg tgc gaa acg gca gcg aaa gac aac aag ctg atg gcg att 2399

Asp Trp Leu Cys Glu Thr Ala Ala Lys Asp Asn Lys Leu Met Ala Ile
330 335 340

act ccg gcg atg cgt gaa ggt tcc ggc atg gtc gag ttt tca cgt aaa 2447

Thr Pro Ala Met Arg Glu Gly Ser Gly Met Val Glu Phe Ser Arg Lys
345 350 355

ttc ccg gat cgc tac ttc gac gtg gca att gcc gag caa cac gcg gtg 2495

Phe Pro Asp Arg Tyr Phe Asp Val Ala Ile Ala Glu Gln His Ala Val
360 365 370

acc ttt gct gcg ggt ctg gcg att ggt ggg tac aaa ccc att gtc gcg 2543

Thr Phe Ala Ala Gly Leu Ala Ile Gly Gly Tyr Lys Pro Ile Val Ala
375 380 385 390

att tac tcc act ttc ctg caa cgc gcc tat gat cag gtg ctg cat gac 2591

Ile Tyr Ser Thr Phe Leu Gln Arg Ala Tyr Asp Gln Val Leu His Asp

395 400 405

gtg gcg att caa aag ctt ccg gtc ctg ttc gcc atc gac cgc gcg ggc 2639

Val Ala Ile Gln Lys Leu Pro Val Leu Phe Ala Ile Asp Arg Ala Gly
410 415 420

att gtt ggt gct gac ggt caa acc cat cag ggt gct ttt gat ctc tct 2687

Ile Val Gly Ala Asp Gly Gln Thr His Gln Gly Ala Phe Asp Leu Ser
425 430 435

tac ctg cgc tgc ata ccg gaa atg gtc att atg acc ccg agc gat gaa 2735

Tyr Leu Arg Cys Ile Pro Glu Met Val Ile Met Thr Pro Ser Asp Glu
440 445 450

aac gaa tgt cgc cag atg ctc tat acc ggc tat cac tat aac gat ggc 2783

Asn Glu Cys Arg Gln Met Leu Tyr Thr Gly Tyr His Tyr Asn Asp Gly
455 460 465 470

ccg tca gcg gtg cgc tac ccg cgt ggc aac gcg gtc ggc gtg gaa ctg 2831

Pro Ser Ala Val Arg Tyr Pro Arg Gly Asn Ala Val Gly Val Glu Leu
475 480 485

acg ccg ctg gaa aaa cta cca att ggc aaa ggc att gtg aag cgt cgt 2879

Thr Pro Leu Glu Lys Leu Pro Ile Gly Lys Gly Ile Val Lys Arg Arg
490 495 500

ggc gag aaa ctg gcg atc ctt aac ttt ggt acg ctg atg cca gaa gcg 2927

Gly Glu Lys Leu Ala Ile Leu Asn Phe Gly Thr Leu Met Pro Glu Ala
505 510 515

gcg aaa gtc gcc gaa tcg ctg aac gcc acg ctg gtc gat atg cgt ttt 2975

Ala Lys Val Ala Glu Ser Leu Asn Ala Thr Leu Val Asp Met Arg Phe
520 525 530

gtg aaa ccg ctt gat gaa gcg tta att ctg gaa atg gcc gcc agc cat 3023

Val Lys Pro Leu Asp Glu Ala Leu Ile Leu Glu Met Ala Ala Ser His
535 540 545 550

gaa gcg ctg gtc acc gta gaa gaa aac gcc att atg ggc ggc gca ggc 3071

Glu Ala Leu Val Thr Val Glu Glu Asn Ala Ile Met Gly Gly Ala Gly
555 560 565

agc ggc gtg aac gaa gtg ctg atg gcc cat cgt aaa cca gta ccc gtg 3119

Ser Gly Val Asn Glu Val Leu Met Ala His Arg Lys Pro Val Pro Val
570 575 580

ctg aac att ggc ctg ccg gac ttc ttt att ccg caa gga act cag gaa 3167

Leu Asn Ile Gly Leu Pro Asp Phe Phe Ile Pro Gln Gly Thr Gln Glu
585 590 595

gaa atg cgc gcc gaa ctc ggc ctc gat gcc gct ggt atg gaa gcc aaa 3215

Glu Met Arg Ala Glu Leu Gly Leu Asp Ala Ala Gly Met Glu Ala Lys
600 605 610

atc aag gcc tgg ctg gca taatccctac tccactcctg ctatgcttaa 3263

Ile Lys Ala Trp Leu Ala
615 620

gaaattattc atagactcta aataattcga gttgcaggaa ggcggcaaac gagtgaagcc 3323

ccaggagctt acataagtaa gtg act ggg gtg aac gaa tgc agc cgc agc aca 3376

Val Thr Gly Val Asn Glu Cys Ser Arg Ser Thr
1 5 10

tgc aac ttg aag tat gac gag tat agc agg agt ggc agc atg caa tac 3424

Cys Asn Leu Lys Tyr Asp Glu Tyr Ser Arg Ser Gly Ser Met Gln Tyr
15 20 25

aac ccc tta gga aaa acc gac ctt cgc gtt tcc cga ctt tgc ctc ggc 3472

Asn Pro Leu Gly Lys Thr Asp Leu Arg Val Ser Arg Leu Cys Leu Gly
30 35 40

tgt atg acc ttt ggc gag cca gat cgc ggt aat cac gca tgg aca ctg 3520

Cys Met Thr Phe Gly Glu Pro Asp Arg Gly Asn His Ala Trp Thr Leu
45 50 55

ccg gaa gaa agc agc cgt ccc ata att aaa cgt gca ctg gaa ggc ggc 3568

Pro Glu Glu Ser Ser Arg Pro Ile Ile Lys Arg Ala Leu Glu Gly Gly
60 65 70 75

ata aat ttc ttt gat acc gcc aac agt tat tct gac ggc agc agc gaa 3616

Ile Asn Phe Phe Asp Thr Ala Asn Ser Tyr Ser Asp Gly Ser Ser Glu
80 85 90

gag atc gtc ggt cgc gca ctg cgg gat ttc gcc cgt cgt gaa gac gtg 3664

Glu Ile Val Gly Arg Ala Leu Arg Asp Phe Ala Arg Arg Glu Asp Val
95 100 105

gtc gtt gcg acc aaa gtg ttc cat cgc gtt ggt gat tta ccg gaa gga 3712

Val Val Ala Thr Lys Val Phe His Arg Val Gly Asp Leu Pro Glu Gly
110 115 120

tta tcc cgt gcg caa att ttg cgc tct atc gac gac agc ctg cga cgt 3760

Leu Ser Arg Ala Gln Ile Leu Arg Ser Ile Asp Asp Ser Leu Arg Arg
125 130 135

ctc ggc atg gat tat gtc gat atc ctg caa att cat cgc tgg gat tac 3808

Leu Gly Met Asp Tyr Val Asp Ile Leu Gln Ile His Arg Trp Asp Tyr
140 145 150 155

aac acg ccg atc gaa gag acg ctg gaa gcc ctc aac gac gtg gta aaa 3856

Asn Thr Pro Ile Glu Glu Thr Leu Glu Ala Leu Asn Asp Val Val Lys
160 165 170

gcc ggg aaa gcg cgt tat atc ggc gcg tca tca atg cac gct tcg cag 3904

Ala Gly Lys Ala Arg Tyr Ile Gly Ala Ser Ser Met His Ala Ser Gln
175 180 185

ttt gct cag gca ctg gaa ctc caa aaa cag cac ggc tgg gcg cag ttt 3952

Phe Ala Gln Ala Leu Glu Leu Gln Lys Gln His Gly Trp Ala Gln Phe
190 195 200

gtc agt atg cag gat cac tac aat ctg att tat cgt gaa gaa gag cgc 4000

Val Ser Met Gln Asp His Tyr Asn Leu Ile Tyr Arg Glu Glu Glu Arg
205 210 215

gag atg cta cca ctg tgt tat cag gag ggc gtg gcg gta att cca tgg 4048

Glu Met Leu Pro Leu Cys Tyr Gln Glu Gly Val Ala Val Ile Pro Trp
220 225 230 235

agc ccg ctg gca agg ggc cgt ctg acg cgt ccg tgg gga gaa act acc 4096

Ser Pro Leu Ala Arg Gly Arg Leu Thr Arg Pro Trp Gly Glu Thr Thr
240 245 250

gca cga ctg gtg tct gat gag gtg ggg aaa aat ctc tat aaa gaa agc 4144

Ala Arg Leu Val Ser Asp Glu Val Gly Lys Asn Leu Tyr Lys Glu Ser
255 260 265

gat gaa aat gac gcg cag atc gca gag cgg tta aca ggc gtc agt gaa 4192

Asp Glu Asn Asp Ala Gln Ile Ala Glu Arg Leu Thr Gly Val Ser Glu
270 275 280

gaa ctg ggg gcg aca cga gca caa gtt gcg ctg gcc tgg ttg ttg agt 4240

Glu Leu Gly Ala Thr Arg Ala Gln Val Ala Leu Ala Trp Leu Leu Ser
285 290 295

aaa ccg ggc att gcc gca ccg att atc gga act tcg cgc gaa gaa cag 4288

Lys Pro Gly Ile Ala Ala Pro Ile Ile Gly Thr Ser Arg Glu Glu Gln
300 305 310 315

ctt gat gag cta ttg aac gcg gtg gat atc act ttg aag ccg gaa cag 4336

Leu Asp Glu Leu Leu Asn Ala Val Asp Ile Thr Leu Lys Pro Glu Gln
320 325 330

att gcc gaa ctg gaa acg ccg tat aaa ccg cat cct gtc gta gga ttt 4384

Ile Ala Glu Leu Glu Thr Pro Tyr Lys Pro His Pro Val Val Gly Phe
335 340 345

aaa taa 4390

Lys

<210> 12
<211> 33
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:Synthetic DNA

<400> 12
ccggatccat ggcggcaatg gttcgttggc aag 33

<210> 13

<211> 34

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:Synthetic DNA

<400> 13

ccgaattctt atttaaatcc tacgacagga tgcg 34

<210> 14

<211> 33

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:Synthetic DNA

<400> 14

ccggatccat gagttttgat attgccaaat acc 33

<210> 15

<211> 33

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:Synthetic DNA

<400> 15

ccgaattctt atgccagcca ggccttgatt ttg 33

<210> 16

<211> 33

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:Synthetic DNA

<400> 16

ccgaattctt actcattgtc cggtgtaaaa ggg 33

<210> 17

<211> 33

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:Synthetic DNA

<400> 17

ccggatccat ggactttccg cagcaactcg aag 33

<210> 18

<211> 33

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:Synthetic DNA

<400> 18

ccgaattctt atttattacg ctggatgatg tag 33

<210> 19

<211> 33

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:Synthetic DNA

<400> 19

ccggatccta atccctactc cactcctgct atg 33

<210> 20

<211> 30

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:Synthetic DNA

<400> 20

gggggatcca agcaactcac cattctgggc 30

<210> 21

<211> 30

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:Synthetic DNA

<400> 21

gggggatccg cttgcgagac gcatcacctc 30

<210> 22

<211> 32

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:Synthetic DNA

<400> 22

gggggatcca gttttgatat tgccaaatac cc 32

<210> 23

<211> 32

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:Synthetic DNA

<400> 23

gggggatcct gccagccagg ccttgatttt gg 32

<210> 24

<211> 30

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:Synthetic DNA

<400> 24

gggggatccg agcaactcac cattctgggc 30

<210> 25

<211> 30

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:Synthetic DNA

<400> 25

gggggatccg cttgcgagac gcatcacctc 30

<210> 26

<211> 637

<212> PRT

<213> Rhodobacter sphaeroides

<400> 26

Met Thr Asp Arg Pro Cys Thr Pro Thr Leu Asp Arg Val Thr Leu Pro
1 5 10 15

Val Asp Met Lys Gly Leu Thr Asp Arg Glu Leu Arg Ser Leu Ala Asp
20 25 30

Glu Leu Arg Ala Glu Thr Ile Ser Ala Val Ser Val Thr Gly Gly His
35 40 45

Leu Gly Ala Gly Leu Gly Val Val Glu Leu Thr Val Ala Leu His Ala
50 55 60

Val Phe Asp Ala Pro Arg Asp Lys Ile Ile Trp Asp Val Gly His Gln
65 70 75 80

Cys Tyr Pro His Lys Ile Leu Thr Gly Arg Arg Asp Arg Ile Arg Thr
85 90 95

Leu Arg Gln Gly Gly Gly Leu Ser Gly Phe Thr Lys Arg Ser Glu Ser
100 105 110

Pro Tyr Asp Cys Phe Gly Ala Gly His Ser Ser Thr Ser Ile Ser Ala
115 120 125

Ala Val Gly Phe Ala Ala Ala Arg Glu Met Gly Gly Asp Thr Gly Asp
130 135 140

Ala Val Ala Val Ile Gly Asp Gly Ser Met Ser Ala Gly Met Ala Phe
145 150 155 160

Glu Ala Leu Asn His Gly Gly His Leu Lys Asn Arg Val Ile Val Ile
165 170 175

Leu Asn Asp Asn Glu Met Ser Ile Ala Pro Pro Val Gly Ala Leu Ser
180 185 190

Ser Tyr Leu Ser Arg Leu Tyr Ala Gly Ala Pro Phe Gln Asp Phe Lys
195 200 205

Ala Ala Ala Lys Gly Ala Leu Gly Leu Leu Pro Glu Pro Phe Gln Glu
210 215 220

Gly Ala Arg Arg Ala Lys Glu Met Leu Lys Ser Val Thr Val Gly Gly
225 230 235 240

Thr Leu Phe Glu Glu Leu Gly Phe Ser Tyr Val Gly Pro Ile Asp Gly
245 250 255

His Asp Leu Asp Gln Leu Leu Pro Val Leu Arg Thr Val Lys Gln Arg
260 265 270

Ala His Ala Pro Val Leu Ile His Val Ile Thr Lys Lys Gly Arg Gly

275 280 285

Tyr Ala Pro Ala Glu Ala Ala Arg Asp Arg Gly His Ala Thr Asn Lys
290 295 300

Phe Asn Val Leu Thr Gly Ala Gln Val Lys Pro Val Ser Asn Ala Pro
305 310 315 320

Ser Tyr Thr Lys Val Phe Ala Gln Ser Leu Ile Lys Glu Ala Glu Val
325 330 335

Asp Glu Arg Ile Cys Ala Val Thr Ala Ala Met Pro Asp Gly Thr Gly
340 345 350

Leu Asn Leu Phe Gly Glu Arg Phe Pro Lys Arg Thr Phe Asp Val Gly
355 360 365

Ile Ala Glu Gln His Ala Val Thr Phe Ser Ala Ala Leu Ala Ala Gly
370 375 380

Gly Met Arg Pro Phe Cys Ala Ile Tyr Ser Thr Phe Leu Gln Arg Gly
385 390 395 400

Tyr Asp Gln Ile Val His Asp Val Ala Ile Gln Arg Leu Pro Val Arg
405 410 415

Phe Ala Ile Asp Arg Ala Gly Leu Val Gly Ala Asp Gly Ala Thr His
420 425 430

Ala Gly Ser Phe Asp Val Ala Phe Leu Ser Asn Leu Pro Gly Ile Val
435 440 445

Val Met Ala Ala Ala Asp Glu Ala Glu Leu Val His Met Val Ala Thr
450 455 460

Ala Ala Ala His Asp Glu Gly Pro Ile Ala Phe Arg Tyr Pro Arg Gly
465 470 475 480

Asp Gly Val Gly Val Glu Met Pro Val Lys Gly Val Pro Leu Gln Ile
485 490 495

Gly Arg Gly Arg Val Val Arg Glu Gly Thr Arg Ile Ala Leu Leu Ser
500 505 510

Phe Gly Thr Arg Leu Ala Glu Val Gln Val Ala Ala Glu Ala Leu Arg
515 520 525

Ala Arg Gly Ile Ser Pro Thr Val Ala Asp Ala Arg Phe Ala Lys Pro
530 535 540

Leu Asp Arg Asp Leu Ile Leu Gln Leu Ala Ala His His Glu Ala Leu
545 550 555 560

Ile Thr Ile Glu Glu Gly Ala Ile Gly Gly Phe Gly Ser His Val Ala
565 570 575

Gln Leu Leu Ala Glu Ala Gly Val Phe Asp Arg Gly Phe Arg Tyr Arg
580 585 590

Ser Met Val Leu Pro Asp Thr Phe Ile Asp His Asn Ser Ala Glu Val
595 600 605

Met Tyr Ala Thr Ala Gly Leu Asn Ala Ala Asp Ile Glu Arg Lys Ala
610 615 620

Leu Glu Thr Leu Gly Val Glu Val Leu Ala Arg Arg Ala
625 630 635

<210> 27
<211> 1911
<212> DNA
<213> Rhodobacter sphaeroides

<220>
<221> CDS
<222> (1)..(1911)

<400> 27
atg acc gac aga ccc tgc acg ccg acg ctc gac cgg gtg acg ctc ccg 48
Met Thr Asp Arg Pro Cys Thr Pro Thr Leu Asp Arg Val Thr Leu Pro
1 5 10 15

gtg gac atg aag ggc ctc acg gac cgt gag ctg cgc tcg ctg gcc gac 96
Val Asp Met Lys Gly Leu Thr Asp Arg Glu Leu Arg Ser Leu Ala Asp
20 25 30

gag ctg cgg gcc gaa acg atc tcg gcc gtg tcg gtg acg ggc ggg cat 144
Glu Leu Arg Ala Glu Thr Ile Ser Ala Val Ser Val Thr Gly Gly His
35 40 45

ctg ggc gca ggc ctc ggc gtg gtg gag ttg acg gtt gcg ctg cat gcg 192
Leu Gly Ala Gly Leu Gly Val Val Glu Leu Thr Val Ala Leu His Ala
50 55 60

gtc ttc gat gcg ccg cgc gac aag atc atc tgg gac gtg ggc cac cag 240
Val Phe Asp Ala Pro Arg Asp Lys Ile Ile Trp Asp Val Gly His Gln
65 70 75 80

tgc tac ccc cac aag atc ctg acc ggg cgg cgc gac cgc atc cgc aca 288
Cys Tyr Pro His Lys Ile Leu Thr Gly Arg Arg Asp Arg Ile Arg Thr
85 90 95

ctg cgg cag ggc ggg ggt ctc tcg ggc ttc acc aag cgc tcc gag agc 336
Leu Arg Gln Gly Gly Gly Leu Ser Gly Phe Thr Lys Arg Ser Glu Ser
100 105 110

ccc tac gac tgt ttc ggc gcg ggc cat tcc tcg acc tcg atc tcg gcc 384
Pro Tyr Asp Cys Phe Gly Ala Gly His Ser Ser Thr Ser Ile Ser Ala
115 120 125

gcg gtg ggc ttt gcc gcg gcg cgc gag atg ggc ggc gac acg ggc gac 432
Ala Val Gly Phe Ala Ala Ala Arg Glu Met Gly Gly Asp Thr Gly Asp
130 135 140

gcg gtg gcg gtg atc ggc gat ggc tcg atg tcg gcc ggc atg gcc ttc 480
Ala Val Ala Val Ile Gly Asp Gly Ser Met Ser Ala Gly Met Ala Phe
145 150 155 160

gag gcg ctg aac cac ggc ggg cac ctg aag aac cgg gtg atc gtg atc 528
Glu Ala Leu Asn His Gly Gly His Leu Lys Asn Arg Val Ile Val Ile
165 170 175

ctg aac gac aat gag atg agc atc gcg ccg ccg gtg ggg gcg ctg tcg 576
Leu Asn Asp Asn Glu Met Ser Ile Ala Pro Pro Val Gly Ala Leu Ser

180 185 190

tcc tat ctc tcg cgg ctc tat gcg ggc gcg ccg ttc cag gac ttc aag 624
Ser Tyr Leu Ser Arg Leu Tyr Ala Gly Ala Pro Phe Gln Asp Phe Lys
195 200 205

gcg gcc gcc aag gga gcg ctc ggg ctt ctg ccc gaa ccg ttc cag gag 672
Ala Ala Ala Lys Gly Ala Leu Gly Leu Leu Pro Glu Pro Phe Gln Glu
210 215 220

ggc gcg cgc cgc gcc aag gag atg ctg aag agc gtc acc gtc ggc ggc 720
Gly Ala Arg Arg Ala Lys Glu Met Leu Lys Ser Val Thr Val Gly Gly
225 230 235 240

acg ctc ttc gag gag ctg ggt ttc tcc tat gtc ggc ccg atc gac ggg 768
Thr Leu Phe Glu Glu Leu Gly Phe Ser Tyr Val Gly Pro Ile Asp Gly
245 250 255

cac gat ctc gac cag ctt ctg ccg gtg ctg cgg acc gtc aag cag cgg 816
His Asp Leu Asp Gln Leu Leu Pro Val Leu Arg Thr Val Lys Gln Arg
260 265 270

gcg cat gcg ccg gtg ctg atc cat gtc atc acc aag aag ggc agg ggc 864
Ala His Ala Pro Val Leu Ile His Val Ile Thr Lys Lys Gly Arg Gly
275 280 285

tat gct ccg gcc gag gcc gcg cgc gac cgc ggc cat gcc acg aac aag 912
Tyr Ala Pro Ala Glu Ala Ala Arg Asp Arg Gly His Ala Thr Asn Lys
290 295 300

ttc aac gtc ctg acc ggc gcg cag gtg aag ccg gtc tcg aac gcc ccc 960

Phe Asn Val Leu Thr Gly Ala Gln Val Lys Pro Val Ser Asn Ala Pro
305 310 315 320

tcc tac acc aag gtc ttc gcc cag agc ctc atc aag gag gcc gag gtc 1008
Ser Tyr Thr Lys Val Phe Ala Gln Ser Leu Ile Lys Glu Ala Glu Val
325 330 335

gac gag cgg atc tgc gcg gtg acg gcc gcc atg ccg gac ggg acg ggg 1056
Asp Glu Arg Ile Cys Ala Val Thr Ala Ala Met Pro Asp Gly Thr Gly
340 345 350

ctc aac ctc ttc ggc gag cgg ttt ccg aag cgc acc ttc gac gtg ggc 1104
Leu Asn Leu Phe Gly Glu Arg Phe Pro Lys Arg Thr Phe Asp Val Gly
355 360 365

atc gcg gaa cag cat gcg gtg acc ttc tcg gcg gcg ctt gcg gca ggc 1152
Ile Ala Glu Gln His Ala Val Thr Phe Ser Ala Ala Leu Ala Ala Gly
370 375 380

ggc atg cgg ccc ttc tgc gcg atc tat tcc acc ttc ctc cag cgc ggc 1200
Gly Met Arg Pro Phe Cys Ala Ile Tyr Ser Thr Phe Leu Gln Arg Gly
385 390 395 400

tac gac cag atc gtg cat gac gtg gcg atc cag cgc ctg ccg gtg cgc 1248
Tyr Asp Gln Ile Val His Asp Val Ala Ile Gln Arg Leu Pro Val Arg
405 410 415

ttc gcc atc gat cgc gcg ggc ctc gtg ggg gcg gac ggc gcc acc cat 1296
Phe Ala Ile Asp Arg Ala Gly Leu Val Gly Ala Asp Gly Ala Thr His
420 425 430

gcg ggc tcg ttc gac gtg gcc ttc ctg tcg aac ctg ccc ggc atc gtg 1344
Ala Gly Ser Phe Asp Val Ala Phe Leu Ser Asn Leu Pro Gly Ile Val
435 440 445

gtg atg gcc gcc gcc gac gag gcc gag ctc gtc cat atg gtg gcc acc 1392
Val Met Ala Ala Ala Asp Glu Ala Glu Leu Val His Met Val Ala Thr
450 455 460

gcc gcc gcc cat gac gaa ggg ccc atc gcc ttc cgc tac ccg cgc ggc 1440
Ala Ala Ala His Asp Glu Gly Pro Ile Ala Phe Arg Tyr Pro Arg Gly
465 470 475 480

gac ggc gtg ggg gtc gag atg ccg gtg aag ggc gtg ccg ctc cag atc 1488
Asp Gly Val Gly Val Glu Met Pro Val Lys Gly Val Pro Leu Gln Ile
485 490 495

ggc cgc ggc cgt gtg gtg cgc gag ggc acg cga atc gcg ctt ttg tcc 1536
Gly Arg Gly Arg Val Val Arg Glu Gly Thr Arg Ile Ala Leu Leu Ser
500 505 510

ttc ggc acc cgt ctg gcc gag gtg cag gtg gcc gcc gag gcg ctg cgt 1584
Phe Gly Thr Arg Leu Ala Glu Val Gln Val Ala Ala Glu Ala Leu Arg
515 520 525

gcg cgc ggg atc tct ccc acg gtt gcg gat gcg cgc ttt gca aag ccg 1632
Ala Arg Gly Ile Ser Pro Thr Val Ala Asp Ala Arg Phe Ala Lys Pro
530 535 540

ctc gac cgg gat ctg atc ctg cag ctc gcg gcc cat cac gag gcg ctt 1680
Leu Asp Arg Asp Leu Ile Leu Gln Leu Ala Ala His His Glu Ala Leu

545 550 555 560

atc acc atc gag gag ggc gcc atc ggc ggt ttc ggc agc cat gtg gcg 1728
Ile Thr Ile Glu Glu Gly Ala Ile Gly Gly Phe Gly Ser His Val Ala
565 570 575

cag ctt ctg gcc gag gcc ggg gtc ttc gac cgc ggc ttc cgg tat cgc 1776
Gln Leu Leu Ala Glu Ala Gly Val Phe Asp Arg Gly Phe Arg Tyr Arg
580 585 590

tcg atg gtg ctg ccc gac acg ttc atc gac cac aac agc gcg gag gtg 1824
Ser Met Val Leu Pro Asp Thr Phe Ile Asp His Asn Ser Ala Glu Val
595 600 605

atg tat gcc acc gcc ggg ctg aat gcg gcc gac ata gag cgg aag gcg 1872
Met Tyr Ala Thr Ala Gly Leu Asn Ala Ala Asp Ile Glu Arg Lys Ala
610 615 620

ctg gag acg ctg ggg gtg gag gtc ctc gcc cgc cgc gcc 1911
Leu Glu Thr Leu Gly Val Glu Val Leu Ala Arg Arg Ala
625 630 635

<210> 28
<211> 648
<212> PRT
<213> Rhodobacter sphaeroides

<400> 28
Met Thr Asn Pro Thr Pro Arg Pro Glu Thr Pro Leu Leu Asp Arg Val
1 5 10 15

Cys Cys Pro Ala Asp Met Lys Ala Leu Ser Asp Ala Glu Leu Glu Arg
20 25 30

Leu Ala Asp Glu Val Arg Ser Glu Val Ile Ser Val Val Ala Glu Thr
35 40 45

Gly Gly His Leu Gly Ser Ser Leu Gly Val Val Glu Leu Thr Val Ala
50 55 60

Leu His Ala Val Phe Asn Thr Pro Thr Asp Lys Leu Val Trp Asp Val
65 70 75 80

Gly His Gln Cys Tyr Pro His Lys Ile Leu Thr Gly Arg Arg Glu Gln
85 90 95

Met Arg Thr Leu Arg Gln Lys Gly Gly Leu Ser Gly Phe Thr Lys Arg
100 105 110

Ser Glu Ser Ala Tyr Asp Pro Phe Gly Ala Ala His Ser Ser Thr Ser
115 120 125

Ile Ser Ala Ala Leu Gly Phe Ala Met Gly Arg Glu Leu Gly Gln Pro
130 135 140

Val Gly Asp Thr Ile Ala Val Ile Gly Asp Gly Ser Ile Thr Ala Gly
145 150 155 160

Met Ala Tyr Glu Ala Leu Asn His Ala Gly His Leu Asn Lys Arg Leu
165 170 175

Phe Val Ile Leu Asn Asp Asn Asp Met Ser Ile Ala Pro Pro Val Gly

180 185 190

Ala Leu Ala Arg Tyr Leu Val Asn Leu Ser Ser Lys Ala Pro Phe Ala
195 200 205

Thr Leu Arg Ala Ala Ala Asp Gly Leu Glu Ala Ser Leu Pro Gly Pro
210 215 220

Leu Arg Asp Gly Ala Arg Arg Ala Arg Gln Leu Val Thr Gly Met Pro
225 230 235 240

Gly Gly Gly Thr Leu Phe Glu Glu Leu Gly Phe Thr Tyr Val Gly Pro
245 250 255

Ile Asp Gly His Asp Met Glu Ala Leu Leu Gln Thr Leu Arg Ala Ala
260 265 270

Arg Ala Arg Thr Thr Gly Pro Val Leu Ile His Val Val Thr Lys Lys
275 280 285

Gly Lys Gly Tyr Ala Pro Ala Glu Asn Ala Pro Asp Lys Tyr His Gly
290 295 300

Val Asn Lys Phe Asp Pro Val Thr Gly Glu Gln Lys Lys Ser Val Ala
305 310 315 320

Asn Ala Pro Asn Tyr Thr Lys Val Phe Gly Ser Thr Leu Thr Glu Glu
325 330 335

Ala Ala Arg Asp Pro Arg Ile Val Ala Ile Thr Ala Ala Met Pro Ser
340 345 350

Gly Thr Gly Val Asp Ile Met Gln Lys Arg Phe Pro Asn Arg Val Phe
355 360 365

Asp Val Gly Ile Ala Glu Gln His Ala Val Thr Phe Ala Ala Gly Leu
370 375 380

Ala Gly Ala Gly Met Lys Pro Phe Cys Ala Ile Tyr Ser Ser Phe Leu
385 390 395 400

Gln Arg Gly Tyr Asp Gln Ile Ala His Asp Val Ala Leu Gln Asn Leu
405 410 415

Pro Val Arg Phe Val Ile Asp Arg Ala Gly Leu Val Gly Ala Asp Gly
420 425 430

Ala Thr His Ala Gly Ala Phe Asp Val Gly Phe Leu Thr Ser Leu Pro
435 440 445

Asn Met Thr Val Met Ala Ala Ala Asp Glu Ala Glu Leu Ile His Met
450 455 460

Ile Ala Thr Ala Val Ala Phe Asp Glu Gly Pro Ile Ala Phe Arg Phe
465 470 475 480

Pro Arg Gly Glu Gly Val Gly Val Glu Met Pro Glu Arg Gly Thr Val
485 490 495

Leu Glu Pro Gly Arg Gly Arg Val Val Arg Glu Gly Thr Asp Val Ala
500 505 510

Ile Leu Ser Phe Gly Ala His Leu His Glu Ala Leu Gln Ala Ala Lys
515 520 525

Leu Leu Glu Ala Glu Gly Val Ser Val Thr Val Ala Asp Ala Arg Phe
530 535 540

Ser Arg Pro Leu Asp Thr Gly Leu Ile Asp Gln Leu Val Arg His His
545 550 555 560

Ala Ala Leu Val Thr Val Glu Gln Gly Ala Met Gly Gly Phe Gly Ala
565 570 575

His Val Met His Tyr Leu Ala Asn Ser Gly Gly Phe Asp Gly Gly Leu
580 585 590

Ala Leu Arg Val Met Thr Leu Pro Asp Arg Phe Ile Glu Gln Ala Ser
595 600 605

Pro Glu Asp Met Tyr Ala Asp Ala Gly Leu Arg Ala Glu Asp Ile Ala
610 615 620

Ala Thr Ala Arg Gly Ala Leu Ala Arg Gly Arg Val Met Pro Leu Arg
625 630 635 640

Gln Thr Ala Lys Pro Arg Ala Val
645

<210> 29
<211> 1944
<212> DNA
<213> Rhodobacter sphaeroides

<220>

<221> CDS

<222> (1).. (1944)

<400> 29

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atg acc aat ccc acc ccg cga ccc gaa acc ccg ctt ttg gat cgc gtc   48
Met Thr Asn Pro Thr Pro Arg Pro Glu Thr Pro Leu Leu Asp Arg Val
 1               5                  10                  15

tgc tgc ccg gcc gac atg aag gcg ctg agt gac gcc gaa ctg gag cgg   96
Cys Cys Pro Ala Asp Met Lys Ala Leu Ser Asp Ala Glu Leu Glu Arg
            20                  25                  30

ctg gcc gac gaa gtg cgt tcc gag gtg att tcg gtc gtt gcc gag acg  144
Leu Ala Asp Glu Val Arg Ser Glu Val Ile Ser Val Val Ala Glu Thr
        35                  40                  45

gga gga cat ctg ggg tcc tcg ctg ggg gtg gtc gag ctg acc gtc gcg  192
Gly Gly His Leu Gly Ser Ser Leu Gly Val Val Glu Leu Thr Val Ala
    50                  55                  60

ctg cat gca gtc ttc aac acg ccc acc gac aag ctc gtc tgg gac gtg  240
Leu His Ala Val Phe Asn Thr Pro Thr Asp Lys Leu Val Trp Asp Val
65                  70                  75                  80

ggc cac cag tgc tac ccc cac aag atc ctc acc ggc cgg cgc gag cag  288
Gly His Gln Cys Tyr Pro His Lys Ile Leu Thr Gly Arg Arg Glu Gln
                85                  90                  95

atg cgc acc ctg cgc cag aag ggc ggc ctc tcg ggc ttc acc aag cgc  336
Met Arg Thr Leu Arg Gln Lys Gly Gly Leu Ser Gly Phe Thr Lys Arg
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100 105 110

tcg gaa tcc gcc tac gac ccg ttc ggc gcg gcc cat tcc tcg acc tcg 384
Ser Glu Ser Ala Tyr Asp Pro Phe Gly Ala Ala His Ser Ser Thr Ser
115 120 125

atc tcg gcc gcg ctc ggc ttt gcc atg ggc cgc gag ctg ggc caa ccc 432
Ile Ser Ala Ala Leu Gly Phe Ala Met Gly Arg Glu Leu Gly Gln Pro
130 135 140

gtg ggc gac acg atc gcc gtg atc ggc gac ggc tcg atc acc gcg ggc 480
Val Gly Asp Thr Ile Ala Val Ile Gly Asp Gly Ser Ile Thr Ala Gly
145 150 155 160

atg gcc tac gag gcg ctg aac cac gcg ggc cat ctg aac aag cgc ctg 528
Met Ala Tyr Glu Ala Leu Asn His Ala Gly His Leu Asn Lys Arg Leu
165 170 175

ttc gtg atc ctg aac gac aat gac atg agc atc gcg ccg ccc gtg ggg 576
Phe Val Ile Leu Asn Asp Asn Asp Met Ser Ile Ala Pro Pro Val Gly
180 185 190

gct ctg gcg cgc tat ctc gtg aat ctc tcc tcg aag gcg ccc ttc gcc 624
Ala Leu Ala Arg Tyr Leu Val Asn Leu Ser Ser Lys Ala Pro Phe Ala
195 200 205

acg ctg cgc gcg gcc gcc gac ggg ctc gag gcc tcg ctg ccg ggg ccg 672
Thr Leu Arg Ala Ala Ala Asp Gly Leu Glu Ala Ser Leu Pro Gly Pro
210 215 220

ctc cgc gac ggg gcg cgc cgg gcg cgc cag ctc gtg acc ggg atg ccg 720

Leu Arg Asp Gly Ala Arg Arg Ala Arg Gln Leu Val Thr Gly Met Pro
225 230 235 240

ggc ggg ggc acg ctc ttc gag gag ctg ggc ttc acc tat gtg ggt ccc 768
Gly Gly Gly Thr Leu Phe Glu Glu Leu Gly Phe Thr Tyr Val Gly Pro
245 250 255

atc gac ggc cac gac atg gag gcg ctg ctc cag acg ctg cgc gcg gcg 816
Ile Asp Gly His Asp Met Glu Ala Leu Leu Gln Thr Leu Arg Ala Ala
260 265 270

cgg gcc cgg acc acg ggg ccg gtg ctc atc cat gtg gtc acg aag aag 864
Arg Ala Arg Thr Thr Gly Pro Val Leu Ile His Val Val Thr Lys Lys
275 280 285

ggc aag ggc tac gcc cct gcc gag aat gcc ccc gac aag tat cac ggg 912
Gly Lys Gly Tyr Ala Pro Ala Glu Asn Ala Pro Asp Lys Tyr His Gly
290 295 300

gtg aac aag ttc gac ccc gtc acg ggc gag cag aag aag tcg gtc gcc 960
Val Asn Lys Phe Asp Pro Val Thr Gly Glu Gln Lys Lys Ser Val Ala
305 310 315 320

aac gcg ccg aac tac acc aag gtc ttc ggc tcc acc ctg acc gag gag 1008
Asn Ala Pro Asn Tyr Thr Lys Val Phe Gly Ser Thr Leu Thr Glu Glu
325 330 335

gcc gcg cgc gat ccg cgc atc gtg gcc atc acc gcg gcc atg ccc tcg 1056
Ala Ala Arg Asp Pro Arg Ile Val Ala Ile Thr Ala Ala Met Pro Ser
340 345 350

ggc acc ggc gtc gac atc atg cag aag cgt ttc ccg aac cgc gtc ttc 1104
Gly Thr Gly Val Asp Ile Met Gln Lys Arg Phe Pro Asn Arg Val Phe
355 360 365

gac gtg ggc atc gcc gag cag cat gcc gtg acc ttc gcg gcg ggc ctt 1152
Asp Val Gly Ile Ala Glu Gln His Ala Val Thr Phe Ala Ala Gly Leu
370 375 380

gcc ggg gcc ggg atg aag ccc ttc tgc gcg atc tat tcc tcg ttc ctg 1200
Ala Gly Ala Gly Met Lys Pro Phe Cys Ala Ile Tyr Ser Ser Phe Leu
385 390 395 400

caa cgg ggc tac gac cag atc gcc cat gac gtg gcg ctg cag aac ctt 1248
Gln Arg Gly Tyr Asp Gln Ile Ala His Asp Val Ala Leu Gln Asn Leu
405 410 415

ccc gtc cgc ttc gtg atc gac cgg gcg ggg ctc gtg ggg gcc gac ggt 1296
Pro Val Arg Phe Val Ile Asp Arg Ala Gly Leu Val Gly Ala Asp Gly
420 425 430

gcg acc cat gcg ggg gcc ttc gat gtg ggc ttc ctc acg tcg ctg ccc 1344
Ala Thr His Ala Gly Ala Phe Asp Val Gly Phe Leu Thr Ser Leu Pro
435 440 445

aat atg acc gtg atg gcc gcg gcc gac gag gcc gag ctc atc cac atg 1392
Asn Met Thr Val Met Ala Ala Ala Asp Glu Ala Glu Leu Ile His Met
450 455 460

atc gcc acc gcc gtg gcc ttc gac gag ggc ccc att gcc ttc cgc ttc 1440
Ile Ala Thr Ala Val Ala Phe Asp Glu Gly Pro Ile Ala Phe Arg Phe

465 470 475 480

ccg cgg ggc gag ggg gtg ggc gtc gag atg ccc gag cgc ggg acc gtg 1488
Pro Arg Gly Glu Gly Val Gly Val Glu Met Pro Glu Arg Gly Thr Val
485 490 495

ctg gaa ccc ggc cgg ggc cgc gtg gtg cgc gag ggg acg gat gtg gcg 1536
Leu Glu Pro Gly Arg Gly Arg Val Val Arg Glu Gly Thr Asp Val Ala
500 505 510

atc ctt tcc ttc ggc gcg cat ctg cac gag gcc ttg cag gcg gcg aaa 1584
Ile Leu Ser Phe Gly Ala His Leu His Glu Ala Leu Gln Ala Ala Lys
515 520 525

ctc ctc gag gcc gag ggg gtg agc gtg acc gtg gcc gac gcc cgc ttc 1632
Leu Leu Glu Ala Glu Gly Val Ser Val Thr Val Ala Asp Ala Arg Phe
530 535 540

tcg cgc ccg ctc gac acg ggg ctc att gac cag ctc gtg cgc cat cac 1680
Ser Arg Pro Leu Asp Thr Gly Leu Ile Asp Gln Leu Val Arg His His
545 550 555 560

gcc gcg ctg gtg acg gtg gag cag ggg gcc atg ggc ggc ttc ggc gct 1728
Ala Ala Leu Val Thr Val Glu Gln Gly Ala Met Gly Gly Phe Gly Ala
565 570 575

cat gtc atg cac tat ctc gcc aat tcc ggc ggc ttc gac ggg ggc ctc 1776
His Val Met His Tyr Leu Ala Asn Ser Gly Gly Phe Asp Gly Gly Leu
580 585 590

gcg ctc cgg gtc atg acg ctg ccc gac cgc ttc atc gag cag gcg agc 1824

Ala Leu Arg Val Met Thr Leu Pro Asp Arg Phe Ile Glu Gln Ala Ser
595 600 605

ccc gag gac atg tat gcc gat gcg ggg ctg cgg gcc gag gat atc gcg 1872
Pro Glu Asp Met Tyr Ala Asp Ala Gly Leu Arg Ala Glu Asp Ile Ala
610 615 620

gcc acc gcg cgg ggc gcg ctc gcc cgg ggg cgc gtg atg ccg ctc cgg 1920
Ala Thr Ala Arg Gly Ala Leu Ala Arg Gly Arg Val Met Pro Leu Arg
625 630 635 640

cag acg gca aag ccg cgg gcg gtc 1944
Gln Thr Ala Lys Pro Arg Ala Val
645

<210> 30
<211> 394
<212> PRT
<213> Rhodobacter sphaeroides

<400> 30
Met Arg Ser Leu Ser Ile Phe Gly Ala Thr Gly Ser Ile Gly Glu Ser
1 5 10 15

Thr Phe Asp Leu Val Met Arg Lys Gly Gly Pro Glu Ala Phe Arg Thr
20 25 30

Val Ala Leu Thr Gly Gly Arg Asn Ile Arg Arg Leu Ala Glu Met Ala
35 40 45

Arg Ala Leu Lys Ala Glu Leu Ala Val Thr Ala His Glu Asp Cys Leu
50 55 60

Pro Ala Leu Arg Glu Ala Leu Ala Gly Thr Gly Thr Glu Val Ala Gly
65 70 75 80

Gly Ala Gln Ala Ile Ala Glu Ala Ala Asp Arg Pro Ala Asp Trp Thr
85 90 95

Met Ser Ala Ile Val Gly Ala Ala Gly Leu Val Pro Gly Met Arg Ala
100 105 110

Leu Lys His Gly Arg Thr Leu Ala Leu Ala Asn Lys Glu Ser Leu Val
115 120 125

Thr Ala Gly Gln Leu Leu Met Arg Thr Ala Gln Glu Asn Gly Ala Thr
130 135 140

Ile Leu Pro Val Asp Ser Glu His Ser Ala Val Phe Gln Ala Leu Ala
145 150 155 160

Gly Glu Asp Thr Ala Cys Val Glu Arg Val Ile Ile Thr Ala Ser Gly
165 170 175

Gly Pro Phe Arg Asp Trp Ser Leu Glu Arg Ile Arg Ala Cys Thr Val
180 185 190

Ala Glu Ala Gln Ala His Pro Asn Trp Ser Met Gly Gln Arg Ile Ser
195 200 205

Ile Asp Ser Ala Ser Met Phe Asn Lys Ala Leu Glu Leu Ile Glu Thr
210 215 220

Arg Glu Phe Phe Gly Phe Glu Pro Asp Arg Ile Glu Ala Val Val His
225 230 235 240

Pro Gln Ser Ile Val His Ala Met Val Gly Phe Cys Asp Gly Gly Leu
245 250 255

Met Ala His Leu Gly Pro Ala Asp Met Arg His Ala Ile Gly Phe Ala
260 265 270

Leu Asn Trp Pro Gly Arg Gly Glu Val Pro Val Ala Arg Ile Asp Leu
275 280 285

Ala Gln Ile Ala Ser Leu Thr Phe Gln Lys Pro Asp Glu Glu Arg Phe
290 295 300

Pro Ala Leu Arg Leu Ala Arg Asp Val Met Ala Ala Arg Gly Leu Ser
305 310 315 320

Gly Ala Ala Phe Asn Ala Ala Lys Glu Ile Ala Leu Asp His Phe Ile
325 330 335

Ala Gly Arg Ile Gly Phe Leu Asp Met Ala Ala Val Val Glu Glu Thr
340 345 350

Leu Ala Gly Val Ser Thr Asp Pro Leu Phe Gly Lys Val Pro Asp Ala
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Thr Phe Asp Leu Val Met Arg Lys Gly Gly Pro Glu Ala Phe Arg Thr
20 25 30

gtc gct ctg acc ggc ggg cgc aac atc cgg cga ctg gcc gaa atg gcg 144
Val Ala Leu Thr Gly Gly Arg Asn Ile Arg Arg Leu Ala Glu Met Ala
35 40 45

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Arg Ala Leu Lys Ala Glu Leu Ala Val Thr Ala His Glu Asp Cys Leu
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Pro Ala Leu Arg Glu Ala Leu Ala Gly Thr Gly Thr Glu Val Ala Gly

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Gly Ala Gln Ala Ile Ala Glu Ala Ala Asp Arg Pro Ala Asp Trp Thr
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Met Ser Ala Ile Val Gly Ala Ala Gly Leu Val Pro Gly Met Arg Ala
100 105 110

ctg aag cac ggc cgc acg ctg gcg ctc gcc aac aag gaa agc ctc gtg 384
Leu Lys His Gly Arg Thr Leu Ala Leu Ala Asn Lys Glu Ser Leu Val
115 120 125

acg gca ggg caa ctc ctg atg cgg acg gcc cag gag aac ggc gcc acg 432
Thr Ala Gly Gln Leu Leu Met Arg Thr Ala Gln Glu Asn Gly Ala Thr
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Ile Leu Pro Val Asp Ser Glu His Ser Ala Val Phe Gln Ala Leu Ala
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Gly Glu Asp Thr Ala Cys Val Glu Arg Val Ile Ile Thr Ala Ser Gly
165 170 175

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Gly Pro Phe Arg Asp Trp Ser Leu Glu Arg Ile Arg Ala Cys Thr Val
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Ala Glu Ala Gln Ala His Pro Asn Trp Ser Met Gly Gln Arg Ile Ser
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Ile Asp Ser Ala Ser Met Phe Asn Lys Ala Leu Glu Leu Ile Glu Thr
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Arg Glu Phe Phe Gly Phe Glu Pro Asp Arg Ile Glu Ala Val Val His
225 230 235 240

ccg caa tcc atc gtc cat gcg atg gtg ggc ttc tgc gac ggg ggc ctg 768
Pro Gln Ser Ile Val His Ala Met Val Gly Phe Cys Asp Gly Gly Leu
245 250 255

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260 265 270

ctg aac tgg ccg ggt cgc ggc gag gtg ccc gtc gcc cgg atc gac ctc 864
Leu Asn Trp Pro Gly Arg Gly Glu Val Pro Val Ala Arg Ile Asp Leu
275 280 285

gca cag att gcg agc ctc acc ttc cag aag cct gac gag gaa cgc ttt 912
Ala Gln Ile Ala Ser Leu Thr Phe Gln Lys Pro Asp Glu Glu Arg Phe
290 295 300

ccg gcc ctg agg ctt gcg cga gac gtc atg gcg gcg cgc ggc ctg tcg 960
Pro Ala Leu Arg Leu Ala Arg Asp Val Met Ala Ala Arg Gly Leu Ser
305 310 315 320

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325 330 335

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355 360 365

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